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WHITE PINE BLISTER RUST CONTROL

Annual Report
Calendar Year 1966

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
REGION ONE

MISSOULA, MONTANA

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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
REGION 1

Missoula, Montana
April 1967

WHITE PINE BLISTER RUST CONTROL ANNUAL REPORT
Calendar Year 1966

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The following agencies are conducting or are actively cooperating in white pine blister rust control:

U.S. Forest Service

National Park Service

State of Idaho Forestry Department

Clearwater-Potlatch Timber Protective Association

Priest Lake Timber Protective Association

Bureau of Land Management

University of Idaho

Washington State University

Cover photo: Basal stem with scarification method of treatment, St. Joe National Forest.

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Region 1

Division of State and Private Forestry
Branch of Forest Pest Control

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I. HIGHLIGHTS OF 1966 BLISTER RUST CONTROL PROGRAM

A total of 19,270 acres, which included white pine stands and the protection zones, were treated by the Forest Service during the 1966 field season. This included 12,460 acres of National Forest ownership and 6,810 acres of State and private lands.

The National Forest control programs included basal stem antibiotic treatment of 1,990 acres of immature western white pine. Ribes eradication programs included 9,970 acres of hand eradication and 500 acres of chemical eradication using 2,4,5-T.

State and private cooperative programs included 3,700 acres of ribes eradication and 3,110 acres of basal stem antibiotic treatment.

National Park Service crews treated 14,900 acres during fiscal year 1966, including 1,200 acres of basal stem antibiotic treatment in Glacier Park.

A survey was conducted to determine the incidence of blister rust infection in stands from 3 to 21 years of age. All stands examined had a history of ribes eradication, with populations ranging from less than 1 to over 400 ribes per acre. An average annual infection rate of 3 percent was found in the stands regardless of ribes populations present. As a result, no ribes eradication will be done in the western white pine type during 1967.

Evaluation of the antibiotic treatment program was continued. The direct treatment including scarification of the infected area using Acti-dione BR appears to be the only method that gives us some control. The use of this method is now limited to western white pine stands on the best sites. Stands to be treated must have less than 150 crop trees of all species per acre, and the average white pine crop tree requiring treatment must be 6 inches d.b.h. or greater. All lethal infections must be within reach of the ground and less than one-half around the tree bole.

General

A total of 19,270 acres of white pine and protection zone in Region 1 were treated for blister rust control. There were 549 employees engaged in blister rust control work during the season; 410 on National Forest and 139 on State and private programs. In addition, three contractors removed ribes from selected white pine stands on National Forest lands.

The State and Private cooperative program in north Idaho was continued during 1966. Contributions from both the private landowners and the State of Idaho were the same as they have been during the last several years. Neither Montana nor Washington had a cooperative blister rust control program.

The total white pine areas in the National Forest, and State and private programs treated with antibiotics to date include 126,850 acres treated by basal stem methods and 336,740 acres treated from the air by helicopters. Approximately 59,900 acres within these areas have been retreated due to unsatisfactory initial treatment results.

Due to inconclusive effectiveness data, aerial spraying with Phytoactin has been discontinued. No antibiotic aerial spraying has been done in this Region since October 1965.

All basal stem treatment work included scarification of the infection on the tree bole. Only stands where the majority of damaging infection was within reach from the ground were treated by this method. Only infected potential crop trees that were less than one-half girdled were treated in the stands selected. Infections are thoroughly scarified and sprayed with an Acti-dione BR-fuel oil solution.

U.S. FOREST SERVICE AND TIMBER PROTECTIVE ASSOCIATIONS

CALENDAR YEAR 1966 (JANUARY 1-DECEMBER 31)

Clearwater National Forest and Clearwater-Potlatch Timber Protective Association

Basal stem antibiotic work was done on State and private lands in the Browns Creek and Casey Creek units.

Ribes were hand eradicated from areas in the Orofino Creek, Sheep Mountain, Pine Creek, Alder Creek, China-Moose Creek, and Musselshell Creek units.

Chemical eradication of ribes included the retreatment of two clear-cut blocks in the China-Moose Creek unit. This was a helicopter application of 2,4,5-T herbicide to a 430-acre block initially treated in August 1965. The two treatments killed both ribes and brush, removed competition, and resulted in easier planting of white pine and hand eradication of the remaining ribes.

A 16-man mobile trailer camp was used for the Alder-Pine Creek ribes eradication crew.

Three ribes eradication contracts were awarded in 1966. Two of the contracts (116 acres) in the Musselshell unit were completed. The contractor employed women workers on this contract. The third contract, awarded in October 1966, included three areas (201 acres) in Nelson Creek and one area in East Fork Canal Gulch. No eradication work has been previously done on this area.

Coeur d'Alene National Forest

Basal stem antibiotic work was done in the Hudlow and Snowbird units. The stands were first examined for amount of rust damage and stocking. Only those stands where the treatable diseased trees were needed for minimum stocking were treated.

Ribes were removed by hand methods from areas in the potter creek, Flat Creek, Yellow Dog, Deception Creek, and Burnt Cabin units.

Kaniksu and Colville National Forests
and Priest Lake Timber Protective Association

Basal stem antibiotic treatment of young white pine was completed on 660 acres by crews stationed at Kalispell Creek and the Falls Creek Ranger Station.

Ribes eradication crews were stationed at Hughes Meadows and Priest Lake.

One 50-acre ribes eradication contract was completed during 1966. Another contract was awarded but not completed.

Control work was not performed on Priest Lake Timber Protective Association lands.

Kootenai National Forest

Basal stem antibiotic treatment was completed on young white pine in the South Fork of Callahan Creek compartment.

Ribes eradication was confined to areas of established white pine stands less than 10 years old in the Pete Creek compartment.

Crews were quartered at the Troy and Sylvanite Ranger Stations. No temporary camps were necessary.

The project had another effective safety program without any reportable accidents. With continued stress on safety, the operation completed its 14th consecutive year without a lost-time accident.

St. Joe National Forest and Clearwater-
Potlatch Timber Protective Association

Three 30-man field camps were employed on blister rust control work during 1966. The camps were located at the Clarkia Ranger Station, Bob's Creek, and Elk River Work Center.

The Clarkia camp basal stem treated white pine with antibiotics in the Hatton Creek, Bussel Creek, and Clarkia control units.

Ribes were eradicated by hand from areas in the Fisher-Cranberry, Bob's Creek (State and private), and Clarkia units.

A helicopter was used to apply the herbicide 2,4,5-T to heavy ribes concentrations in prescribed burned blocks in Fisher-Cranberry and Bechtel Mountain areas.

NATIONAL PARK SERVICE, MID-WEST REGION
Fiscal Year 1966
(July 1, 1965-June 30, 1966)

The fiscal year 1966 program was conducted as provided by the Lea Act and the current agreement between the U.S. Department of Interior and the U.S. Department of Agriculture. The National Park Service has complete responsibility for planning, operational activities, and coordination between the Parks involved in blister rust control activities. The U.S. Forest Service furnishes interagency leadership and technical assistance in accordance with the agreement between the two agencies.

Glacier National Park

Initial basal stem antibiotic work was completed in the Coal Creek unit. Portions of the North Fork, Lake McDonald, McDonald Creek, and Mineral Creek units were retreated. All work done was on the west side of the Continental Divide in stands of western white pine. Periods of inclement weather prevented the accomplishment of all work planned. Ribes eradication work was not done.

Accomplishments included initially treating 47,500 immature western white pines on 280 acres, and retreating 101,100 immature trees on 920 acres in the above areas. The antibiotic formulation Phytoactin L-440 at 200 p.p.m. in fuel oil with surfactant was used during the first half of the year, and Acti-dione BR at 150 p.p.m. in fuel oil with Triton B-1956 during the second half. Only the basal stem direct canker treatment method with scarification was used.

Cooperation with the U.S. Forest Service in establishing and evaluating whitebark and limber pine studies was continued. Study plots include basal stem and aerial (helicopter) applications. An effective control for blister rust on these high-altitude white pines is urgently needed.

Yellowstone National Park

Recent disease surveys indicate the rust is intensifying in the northern portions of the Park and spreading southward. To meet this development, higher priorities were given to the stands in close proximity to areas of intensification. Ribes eradication work was concentrated in the Obsidian Cliff, Lake Shore, and Willow Park areas.

All program objectives scheduled for fiscal year 1966 were achieved or surpassed. Initial ribes eradication was accomplished on 11,060 acres utilizing 3,360 man-days of labor.

An additional 2,220 acres were maintained with touchup rework as scheduled. Included in the areas worked initially are 310 acres treated by chemical eradication methods. A considerable amount of ribes status checking was done to determine the degree of stabilization and future work requirements.

Grand Teton National Park

No ribes eradication was done. The Snake River-Deadman's Bar area was examined for rust during the fall inspection trip and one Ribes viscosissimum specimen was collected with rust later identified as Cronartium occidentale (pinon rust). White pine blister rust has been previously found on limber pine in this area.

Rocky Mountain National Park

Initial ribes eradication was completed on 420 acres. Included were 50 acres of heavy ribes at timberline and in the ski runs of upper Hidden Valley that were sprayed with portable power units. Another 15 acres in the Beaver Ponds area, which lie adjacent to the Trail Ridge Road, were hand eradicated because of the dense willow growth and high susceptibility of willow to hormone sprays. Much of this work was accomplished in knee-deep water.

Beginning with the 1966 spring program, the species R. montigenum is no longer being eradicated on the Hidden Valley-Windy Gulch unit. This decision was based on the low susceptibility of the species to rust and the mass density of the species in the work unit. Appreciable savings in labor and costs will result.

II. RIBES ERADICATION EFFECTIVENESS SURVEY

A blister rust incidence survey was completed in 1966 on 53 stands of young white pine between 3 and 20 years of age. The purpose was to determine the correlation between the amount of blister rust infection in these stands and past ribes eradication efforts. An average of 3 percent infection per year is occurring in these stands, irrespective of present or past ribes populations. A more complete report is currently being prepared.

Additional blister rust incidence surveys will be made during 1967 to determine the rate and intensity of infection occurring in white pine stands 20 to 50 years of age.

Ribes population and stand description surveys (compartment examination - Stage II) are made a part of each blister rust incidence examination.

III. ANTIBIOTIC TREATMENT EFFECTIVENESS EVALUATIONS

The collection of canker evaluation data from established study strips in antibiotic treated and untreated areas was continued on all Forests in 1966. As reported previously, the determination of the effectiveness of this phase of the control program is most difficult. The wide variation in apparent results is complicated by the natural variation from year to year in canker activity. The results reported in table 1 are tentative only and are shown primarily to point out some of the variation associated with basal stem with scarification treatments. Aerial treatment results are much more variable. They are not reported here because this method of treatment has not been used since 1965.

Table 1.--Antibiotic treatment evaluation summary, Division of State and Private Forestry, 1966

Forest	Area	Cankers 1/ inactive	Percent	Cankers 2/ controlled	Percent	Cankers live 3/	Percent	Total cankers
- - - - - - - - Acti-dione with scarification - treated 1964 - - - - - - - -								
St. Joe	73	16	27.1	23	39.0	20	33.9	59
	75	33	75.0	5	11.4	6	13.6	44
	82	29	80.6	0	0	7	19.4	36
Kaniksu	36	27	49.1	8	14.5	20	36.4	55
	35	18	26.1	16	23.2	35	50.7	69
	34	41	56.1	11	15.1	21	28.8	73
- - - - - - Phytoactin L-440 with scarification - treated 1964 - - - - - -								
Coeur d' Alene	83	24	42.9	12	21.4	20	35.7	56

All areas were treated on an operational basis. None of these data are from developmental plots. All examinations were made during 1966.

1/ Cankers are classified as "inactive" if:

1. All bark within canker area is brownish-black in color, shriveled, and sunken.
2. Callus tissue is visible on more than 50 percent of the total canker perimeter.
3. No sporulation is present.
4. No discoloration is present.
5. No Tuberculina maxima (sporulation) is present.
6. Recent (within past year) rodent chewing is not evident.
7. Study canker or another canker has not girdled the tree.

Table 1.--Antibiotic treatment evaluation summary, Division of State and Private Forestry, 1966 (con.)

2/ Cankers are classified as "controlled" if:

1. Margin of discoloration is less than one-fourth of total canker perimeter.
2. No sporulation present.
3. No recent (within past year) rodent chewing.
4. Study canker or another canker has not girdled the tree.
5. Tuberculina maxima is present.

3/ Any canker that has girdled the tree is called "live." Study cankers on trees that have been girdled by other cankers that may affect the vigor of the study canker are also called "live."

IV. SPREAD OF BLISTER RUST

Personnel from the Forest Service in Regions 1 and 2 and the National Park Service participated in a 2-week blister rust disease survey in north-central Wyoming throughout the Wind River Indian Reservation, and Big Horn and Shoshone National Forests. The purpose of the survey was to determine the advancement of the rust on both pine and ribes from presently known infection centers. The blister rust was found to be intensifying in limber pine in several areas on the east side of the Big Horn Mountain Range. In contrast, the west side of the range revealed light infection. Detailed results will be published as a separate report.

V. ANTIBIOTIC RESEARCH 1/

In 1966 final examinations were made on the two experiments described in the Annual Report for 1965 (pages 42-44) to test the effectiveness of Acti-dione and Phytoactin.

The data, summarized in table 2 by treatments, suggest the following conclusions:

Aerial treatments. --Aerial treatment with Phytoactin is not an effecitve control for blister rust, as has already been concluded by regional personnel in terminating this aspect of their control effort. No significant differences were found between the Phytoactin, the oil check, or the untreated aerial treatments; i.e., the percent of inactive cankers averaged near 1 percent, and canker activity averaged nearly alike for all three treatments after three full growing seasons.

Basal stem treatments.--After four growing seasons, no significant differences were found between the first five treatments (table 2); the percent of inactive cankers ranged from 0 to 1. The Acti-dione treatment was significantly different from the other five, but only 26 percent of the treated cankers were inactive (22 percent were inactive in both 1965 and 1966). In addition, all trees having an inactive canker in this treatment also had at least one active canker either within the treatment zone or above it.

These studies confirm tests on other white pine species; i.e., these two antibiotics are not effective control agents for the blister rust disease. As observed by Phelps in his work with eastern white pine, Acti-dione treatments appear to be chemical excision treatments. If done properly and carefully with scarification, it may be possible to isolate infected tissue from uninfected tissue and, thereby, to induce complete inactivity and perhaps death of cankers. With incomplete scarification a significant, but only partial, reduction in activity may result. As indicated by the canker activity indices for the controls in both aerial and basal stem treatments (table 2), a significant reduction of activity occurs over time in a selected population of cankers because of natural factors. These seriously confound interpretations of treatment effects under forest conditions.

Procedures have been developed for the establishment of cambial explants of Pinus monticola in axenic culture. Vigorous callus tissue has been maintained through monthly subculture for a period of 16 months with no significant reduction in volume growth. Preliminary tests indicate that cambial explants infected with Cronartium ribicola are amenable to axenic culture and produce infected callus. Successful growth of rust fungus in callus culture will provide the necessary means for conducting physiological studies of the fungus and screening potential chemotherapeutants.

Study of Tuberculina maxima, a potential biologic control agent of blister rust, has shown it to be widely distributed and frequently found within the range of P. monticola. It is capable of overwintering in both the vegetative and

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1/ Based on work conducted by the Intermountain Forest and Range Experiment Station, Moscow, Idaho.

spore stages. Although these are desirable attributes of a biologic control agent, T. maxima has some known disadvantages, including low infectivity, low virulence, and variable impact on canker vigor. Mode of action studies will explore how these drawbacks might be modified to increase the effectiveness of this fungus as a control agent.

Table 2.--Evaluation of antibiotics for control of blister rust on western white pine

Treatment	Trees1/		Cankers1/				Average of the percent of margin that was active on the basis of discoloration in 1966			
				Percent			Percent			
	Total No.	Percent killed by blister rust	Total No.	On trees killed-- blister rust	Inactive	Active	1963	1964	1965	1956
BASAL STEM TREATMENTS										
Untreated	85	6	87	7	1 (NS)	92	98.4	89.8	68.4	2/48.2
Scarification only	85	7	88	7	0 (NS)	93	96.9	80.6	64.1	2/38.6
Scarifica- + oil	85	5	89	6	1 (NS)	93	97.1	45.6	41.3	60.5
Scar. + oil + surfactant	85	4	85	4	0 (NS)	96	97.8	61.4	59.0	2/58.5
Scar. + oil + surf. + Phytoactin	85	2	86	2	0 (NS)	98	99.1	28.3	32.3	58.7
Scar. + oil + surf. + Acti-dione	85	13	88	14	26 (S)	60	99.2	4.4	3.9	8.1
AERIAL TREATMENTS										
Untreated	175	7	193	7	2 (NS)	91	--	87.4	58.2	35.3
Oil emulsion + surfactant	175	11	193	13	1 (NS)	86	--	82.2	52.0	42.0
Oil emulsion + surf. + Phytoactin	176	13	205	12	1 (NS)	87	--	87.1	66.7	32.3

1/ Status as of 1966 examinations.

2/ The percent of active canker margin has decreased each year since plot establishment.

NS - Not significant

S - Significant

VI. WHITE PINE ECONOMIC STUDY

The rough draft of the western white pine production and management economic study has been completed by the Intermountain Forest and Range Experiment Station and Region 1 personnel. This study includes basic resource data and the cost of growing and protecting white pine.

The final report will be published in 1967.

VII. BREEDING BLISTER RUST-RESISTANT WESTERN WHITE PINE - 1966

Because of the recent regional decision to curtail blister rust control by means of ribes eradication or antibiotic treatment of white pines, development of resistant planting stock now remains as the best long-range means for controlling the disease. The cooperative Region 1-Intermountain Forest and Range Experiment Station program for development of such planting stock is now well along toward its initial objective.

First-stage seed orchards that will mass-produce second-generation (F_2) white pine planting stocks will be established at Coeur d'Alene, Idaho, and Haugan, Montana, beginning in 1971. First-generation (F_1) foundation stocks destined for establishing these orchards are already in production at the Forestry Sciences Laboratory nursery in Moscow, Idaho. The remainder will be produced and planted at the orchard sites between 1967 and 1974. Thus, we will attain our initial goal--earliest possible production of semiresistant planting stock--by about 1985, when these first-stage orchards come into production.

Naturally, these partially resistant but otherwise unimproved F_2 planting stocks, wherein it is estimated that only about half of the plants will survive long-term field exposure to the rust, are considered only an interim product of the overall research and development program. Orchard and planting costs will be lowered by increasing resistance of the stock, and increased timber yields will be achieved through selection for growth rate among resistant types.

Work toward attaining this longer-range goal will begin in 1967 by searching for about 2,800 more rust-free "candidate" trees in heavily infected natural stands. These new candidates, along with 400 already on hand, will provide the broader genetic base required for making additional gains in resistance, plus improvement of growth rate. Second-stage orchards from this base will succeed first-stage orchards after 15 to 20 years.

New methods 2/ developed at Moscow will reduce the costs of this new work materially. Savings in pollinating and testing new candidates using single, mixed-pollen crosses (instead of conventional series of four or more test crosses) will amount to about $400 per tree tested. With 2,800 new candidates to be tested, these methods improvements will save over $1 million.

2/ Cf. Int. For. & Range Expt. Sta. Res. Note INT-60: 4 pp. 1967.

VIII. STATISTICAL TABLES

Statistical tables summarizing accomplishments on a calendar year basis and expenditures on a fiscal year basis for the National Forest and State and Private programs and a total of all programs are presented in this section. Except where noted, the figures given for National Forests include Public Domain lands. Both accomplishments and expenditures are shown on a fiscal year basis for the National Park program.

SUMMARY OF ALL PROGRAMS

1. Blister Rust Control Expenditures, Fiscal Year 1966[1/]

State	U.S. Forest Service, Region 1 (funds)					State and private	National Park Service	Total
	042	T.S.	411	K-V	Total			
Idaho	1,147,795	91,719	93,016	55,351	1,387,881	86,523	--	1,474,404
Mont.	113,585	4,364	--	--	117,949		39,825	157,774
Wash.	84,995	9,974		6,595	101,564		--	101,564
Colo.							23,267	23,267
Wyo.							116,886	116,886
Total	1,346,375	106,057	93,016	61,946	1,607,394	86,523	179,978	1,873,895

042 - National Forest program including Regional Office expenditures.
T.S. - Technical services.
411 - Federal matching funds for State and private cooperative programs.
K-V - Stand improvement collections used for BRC on National Forest land.

1/ All funds expended in Region 1, including items for developmental work during fiscal year 1966, July 1, 1965 through June 30, 1966.

2. Net Acres of White Pine by Age Classes 1/

Ownership	Age classes by date of origin						Total acres
	1980-1961	1960-1941	1940-1921	1920-1881	1880-1841	1840 & prior	
National Forest	12,800	28,570	208,210	408,740	54,560	323,420	1,036,300
National Park	- - - -	- - - -	Not classified		- - - -	- - - -	143,030
State & Private	3,400	44,470	93,470	129,610	20,720	153,830	444,770
Total	15,200	73,310	301,680	538,350	75,280	477,250	1,624,100

For a detailed breakdown of ownership, refer to the 1965 Blister Rust Contol Annual Report.

1/ This table includes all areas satisfactorily stocked with white pine as of December 31, 1966. The areas reported for the National Forest and the State and private programs have 20 percent or more white pine stocking. The area of white pine type based on plurality of stems or volume is much less than this. This table includes stands which are not white pine type by timber management definition but where blister rust control work has been considered necessary to maintain an adequately stocked stand. White pine sites presently unsatisfactorily stocked and protection zones are not included. The data reported for the National Forest program include only National Forest and Public Domain land. The data reported for the State and private program include only State and private lands.

3. Accumulative Summary of Antibiotic Treatment

Ownership	Idaho		Montana		Washington		Total	
	Total acres	Treated to date	Total acres	Treated to date	Total acres	Treated to date	Acres	Treated to date 1/
National Forest	866,080	319,960	92,570	34,510	77,650	33,400	1,036,300	387,870
National Park 2/	--	--	13,900	11,350	--	--	13,900	11,350
State & Private	431,800	75,720	4,470	--	8,500	--	444,770	75,720
Total	1,297,880	395,680	110,940	45,860	86,150	33,400	1,494,970	474,940

1/ The acres reported as treated through December 31, 1966, include some that that have been retreated.

2/ Only Glacier National Park has an antibiotic treatment program.

4. Antibiotic Treatment by Date and Ownership - Acres[1/]

Owner	1962 and prior	1963	1964	1965	1966	Summary				Total
						Within association		Outside association		
						Hand	Aerial	Hand	Aerial	
National Forest	175,050	102,710	77,160	73,650	1,990	18,870	16,280	69,430	278,340	382,920
Public Domain	1,920	1,610	1,240	210	--	180	740	150	3,880	4,950
State lands	24,810	4,680	13,350	10,290	1,800	22,280	15,190	2,650	6,740	46,860
L. Cardiff, Inc.	270	--	--	--	--	160	110	--	--	270
Diamond Internat.	570	--	230	60	--	200	200	30	370	800
Joslyn Mfg. Co.	--	--	220	--	--	--	--	--	220	220
Mead & Howard	10	30	--	60	--	10	60	30	--	100
Milwaukee Land	730	210	560	580	--	20	230	840	770	1,860
Northern Pacific	290	30	--	270	--	--	--	--	320	320
P.F.I.	8,820	2,850	5,600	6,970	1,310	10,280	10,060	830	1,170	22,340
Other private	1,070	70	1,760	450	--	670	200	220	1,860	2,950
Total	213,540	112,190	100,120	92,540	5,100	52,670	43,070	74,180	293,670	463,590

1/ This table includes all antibiotic treatment work done through December 31, 1966, in Idaho and Montana except Glacier National Park. The accumulative acres by dates will not necessarily add up to the totals shown in the summary section because of retreatment. Some of these acres have been treated more than once; however, an acre is only reported in the summary the first time it is treated.

SUMMARY OF NATIONAL FOREST AND STATE AND PRIVATE PROGRAMS

1. Field Organization, Calendar Year 1966

Program	Camps	Employees				Contractors
		Ribes eradication	Antibiotic treatment	Surveys & other	Total	
National Forest	14	246	98	66	410	3
State and Private	3	64	75	--	139	
Total	17	310	173	66	549	3

2. Total Progress of Ribes Eradication, Calendar Year 1966 1/

Ownership	Acres	Man-days	Ribes	Per acre	
				Man-days	Ribes
National Forest	10,470	10,643	4,264,900	1.02	407
State and Private	3,700	1,548	99,500	.42	27
Total	14,170	12,191	4,364,400	.86	308

1/ All areas worked either initially or reworked are included. The area in table 3 and all work done with Sale Area Betterment (K-V) funds are included.

3. Chemical Eradication, Calendar Year 1966

Ownership	Acres 1/	Man-days	Ribes destroyed	Gallons of spray solution	Man-days per acre
National Forest	500	463	2,280,000	61,400	0.93
State and Private	--	--	--	--	--
Total	500	463	2,280,000	61,400	.93

1/ Acres sprayed with 2,4,5-T herbicide to eradicate ribes. Application was from truck-mounted or backpack sprayers and helicopters. These data are also incorporated in table 2.

4. Antibiotic Treatment--Basal Stem Method, Calendar Year 1966

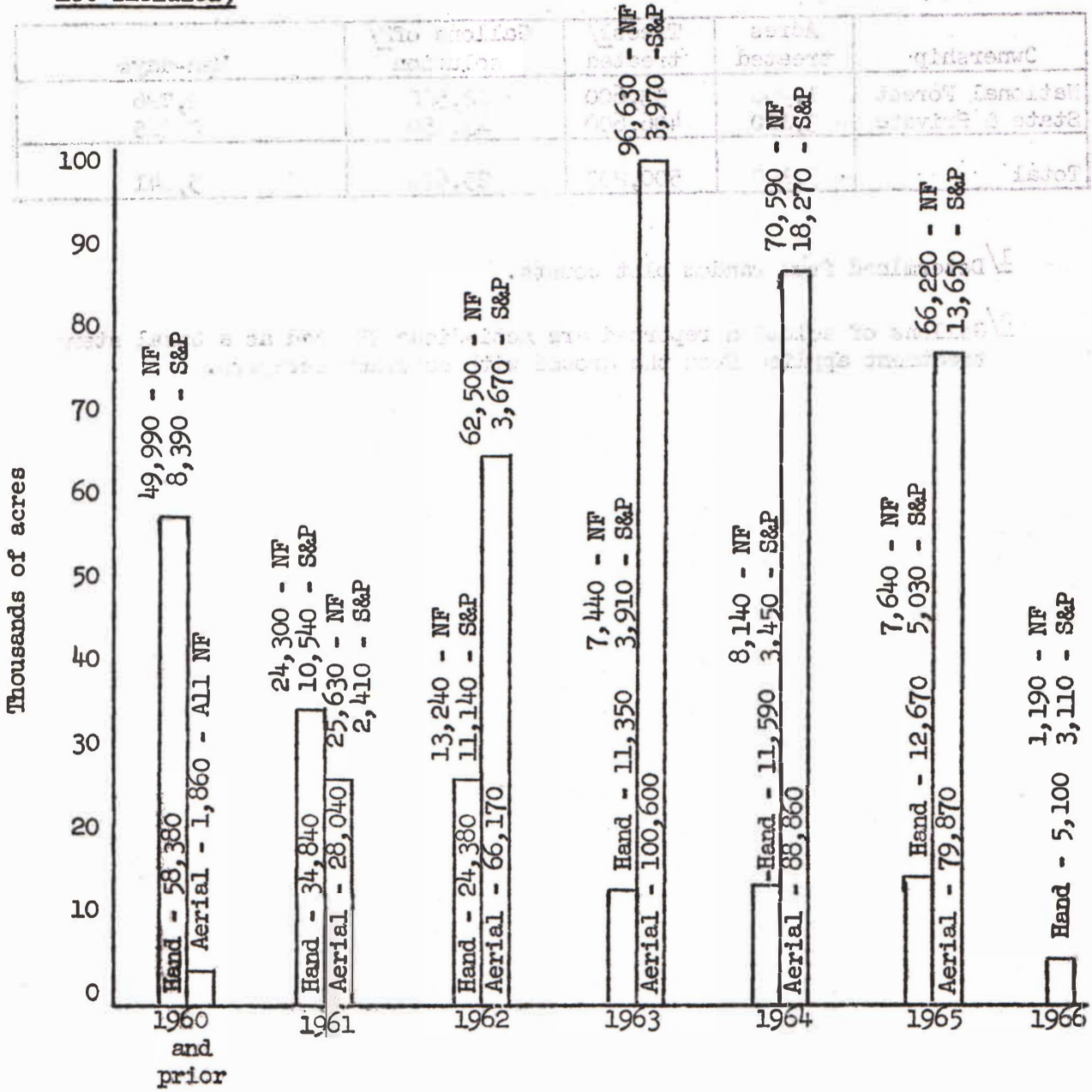
Ownership	Acres treated	Trees 1/ treated	Gallons of 2/ solution	Man-days
National Forest	1,990	93,600	12,520	2,726
State & Private	3,110	406,600	13,150	2,315
Total	5,100	500,200	25,670	5,041

1/ Determined from random plot counts.

2/ Gallons of solution reported are Acti-dione BR used as a basal stem treatment applied from the ground with backpack sprayers.

SUMMARY OF NATIONAL FOREST
AND STATE AND PRIVATE PROGRAMS

5. Region 1 summary of antibiotic treatment through 1966 (National Parks not included)



FEDERAL LANDS

1. Blister Rust Control Expenditures, Fiscal Year 1966

Forest	Funds		
	Regular	K-V	Total
Clearwater	253,761	33,353	287,114
Coeur d'Alene	252,824	21,132	273,956
Colville	355	1,610	1,965
Kaniksu	362,997	5,851	368,848
Kootenai	93,502	--	93,502
St. Joe	235,439	--	235,439
Total	1,198,878	61,946	1,260,824

2. Field Organization, Calendar Year 1966

Forest	Camps	Employees				Contractor
		Ribes eradication	Antibiotic treatment	Surveys & other	Total	
Clearwater	4	106	--	10	116	1
Coeur d'Alene	4	63	29	16	108	
Kaniksu	3	24	37	20	81	2
Kootenai	1	7	6	3	16	
St. Joe	2	46	26	17	89	
All Forests	14	246	98	66	410	3

3. Total Progress of Ribes Eradication, Calendar Year 1966 1/

Forest	Acres	Man-days	Ribes	Per acre	
				Man-days	Ribes
Clearwater	3,950	4,938	1,096,300	1.25	277
Coeur d'Alene	2,610	2,770	407,000	1.06	156
Kaniksu	1,980	1,265	64,300	.64	32
Kootenai	190	129	3,100	.68	16
St. Joe	1,740	1,541	2,694,200	.89	1,548
All Forests	10,470	10,643	4,264,900	1.02	407

1/ All areas worked either initially or reworked are included. Both chemical eradication and all work done with Sale Area Betterment (K-V) funds are included.

4. Chemical Eradication, Calendar Year 1966

Forest	Acres1/	Man-days	Ribes destroyed	Gallons of spray solution	Man-days per acre
Clearwater	190	298	283,000	22,400	1.57
Coeur d'Alene	70	140	49,000	16,800	2.00
Kaniksu	50	19	27,000	19,800	.38
Kootenai	--				
St. Joe	190	6	1,921,000	2,400	.03
All Forests	500	463	2,280,000	61,400	.93

1/Acres sprayed with 2,4,5-T herbicide to eradicate ribes. The application was from truck-mounted or backpack sprayers and helicopters. These data are included in table 3.

5. Antibiotic Treatment--Basal Stem Method, Calendar Year 1966

Forest	Acres treated	Trees treated1/	Gallons of solution 2/	Man-days
Clearwater	--	--	--	--
Coeur d'Alene	310	39,700	2,920	638
Kaniksu	660	38,900	6,500	1,057
Kootenai	170	800	500	140
St. Joe	850	14,200	2,600	891
All Forests	1,990	93,600	12,520	2,726

1/Determined from random plot counts.

2/Gallons of solution reported are Acti-dione BR used as a basal stem treatment applied from the ground with backpack sprayers.

6. K-V Work. Calendar Year 1966

Forest	Ribes eradication		Basal stem antibiotic treatment		Total	
	Acres	Man-days	Acres	Man-days	Acres	Man-days
Clearwater	430	919	--	--	430	919
Coeur d'Alene	790	870	--	--	790	870
Kaniksu	565	688	--	--	565	688
Kootenai	--	--	--	--	--	--
St. Joe	--	--	--	--	--	--
All Forests	1,785	2,477			1,785	2,477

7. Accumulative Summary of Antibiotic Treatment[1/]

Forest	Idaho		Montana		Washington		Total	
	Total acres	Treated to date	Total acres	Treated to date	Total acres	Treated to date	Acres	Treated to date
Clearwater	275,520	58,860	--	--	--	--	275,520	58,860
Coeur d'Alene	277,060	95,600	24,700	3,220	--	--	301,760	98,820
Colville	--	--	--	--	25,640	10,870	25,640	10,870
Kaniksu	169,140	66,500	31,920	9,510	52,010	22,530	253,070	98,540
Kootenai	2,640	630	35,950	21,780	--	--	38,590	22,410
St. Joe	141,720	98,370	--	--	--	--	141,720	98,370
All Forests	866,080	319,960	92,570	34,510	77,650	33,400	1,036,300	[2/]387,870

[1/] Acres reported as treated through December 31, 1966, include some that have been retreated.

[2/] Includes 4,950 acres of Public Domain.

STATE AND PRIVATE LANDS

1. Blister Rust Control Expenditures, Fiscal Year 1966

Forest	Funds				Total all funds
	State	Private	Total S&P	Federal	
Clearwater	32,866	10,702	43,568	44,653	88,221
Kaniksu	4,588	--	4,588	5,553	10,141
St. Joe	30,237	8,756	38,993	40,837	79,830
Total	67,691	19,458	87,149	91,043	178,192

2. Field Organization, Calendar Year 1966

Forest	Camps	Employees			Contractors
		Ribes eradication	Antibiotic treatment	Total	
Clearwater	2	25	75	100	--
Kaniksu	--	--	--	--	--
St. Joe	1	39	--	39	--
Total	3	64	75	139	--

3. Total Progress of Ribes Eradication, Calendar Year 1966

Area	Forest	Acres	Man-days	Ribes	Per acre	
					Man-days	Ribes
Within 1/ association	Clearwater	--	--	--	--	--
	Kaniksu	--	--	--	--	--
	St. Joe	3,700	1,548	99,500	0.42	27
	Total	3,700	1,548	99,500	.42	27

1/No ribes eradication work performed outside of association boundaries. Areas worked initially or reworked are both included.

STATE AND PRIVATE LANDS

4. Antibiotic Treatment--Basal Stem Method, Calendar Year 1966

Area	Forest	Acres treated 1/	Trees treated	Gallons of solution 2/	Man-days
Within association	Clearwater	2,770	397,600	11,140	2,054
	Kaniksu	--	--	--	--
	St. Joe	--	--	--	--
	Total	2,770	397,600	11,140	2,054
Outside association	Clearwater	--	--	--	--
	Kaniksu	310	8,500	1,950	231
	St. Joe	30	500	60	30
	Total	340	9,000	2,010	261
All Forests		3,110	406,600	13,150	2,315

1/Determined from random plot counts.

2/Gallons of solution reported are Acti-dione BR used as a basal stem treatment applied from the ground with backpack sprayers.

5. Accumulative Summary of Antibiotic Treatment 1/

Forest	Ownership	Idaho		Montana		Washington		Total	
		Total acres	Treated to date	Total acres	Treated to date	Total acres	Treated to date	Acres	Treated to date
Clearwater	State	49,890	9,690	--	--	--	--	49,890	9,690
	Private	114,160	17,610	--	--	--	--	114,160	17,610
	Total	164,050	27,300	--	--	--	--	164,050	27,300
Coeur d'Alene	State	14,630	1,220	--	--	--	--	14,630	1,220
	Private	46,840	--	1,970	--	--	--	48,810	--
	Total	61,470	1,220	1,970	--	--	--	63,440	1,220
Colville	State	--	--	--	--	2,550	--	2,550	--
	Private	--	--	--	--	--	--	--	--
	Total	--	--	--	--	2,550	--	2,550	--
Kaniksu	State	35,240	13,010	680	--	710	--	36,630	13,010
	Private	10,840	1,060	1,820	--	5,240	--	17,900	1,060
	Total	46,080	14,070	2,500	--	5,950	--	54,530	14,070
St. Joe	State	53,400	22,940	--	--	--	--	53,400	22,940
	Private	106,800	10,190	--	--	--	--	106,800	10,190
	Total	160,200	33,130	--	--	--	--	160,200	33,130
All Forests	State	153,160	46,860	680	--	3,260	--	157,100	46,860
	Private	278,640	28,860	3,790	--	5,240	--	287,670	28,860
	Total	431,800	75,720	4,470	--	8,500	--	444,770	75,720

1/ Acres reported as treated through December 31, 1966 include some that have been retreated.

NATIONAL PARKS PROGRAM

1. Expenditures, Fiscal Year 1966

Park	State	National Park Funds		
		Park	Regional	Total
Glacier	Montana	34,464	5,361	39,825
Yellowstone	Wyoming	110,333	6,404	116,737
Grand Teton	Wyoming	--	149	149
Rocky Mountain	Colorado	20,289	2,978	23,267
Total		165,086	14,892	179,978

2. Field Organization, Fiscal Year 1966

Park	Camps	Employees		
		Ribes eradication	Antibiotic treatment	Total
Glacier	1		23	23
Rocky Mountain	1	16		16
Yellowstone	3	70	--	70
Total	5	86	23	109

3. Total Progress Ribes Eradication, Fiscal Year 1966

Park	Acres	Man-days	Ribes	Per acre	
				Man-days	Ribes
Rocky Mountain	420	770	515,000	1.83	1,226
Yellowstone	13,280	3,460	470,000	.26	35
Total	13,700	4,230	985,000	.31	72

4. Chemical Eradication, Fiscal Year 1966

Park	Acres	Man-days	Ribes	Gallons of solution
Rocky Mountain	50	440	473,200	17,250
Yellowstone	310	815	297,500	24,500
Total	360	1,255	770,700	41,750

5. Antibiotic Treatment--Basal Stem Method, Fiscal Year 1966

Park	Acres treated	treated	Gallons of solution	Man-days	Man-days per acre
Glacier	1/1,200	148,680	3,020	781	0.65
Total	1,200	148,680	3,020	781	.65

1/ Includes 920 acres of retreatment.

6. Accumulative Summary of Antibiotic Treatment--Acres 1/

Park	Within units		Outside units		All units	
	Total	Treated to date	Total	Treated to date	Total	Treated to date
Glacier 2/	6,010	3,580	7,890	7,770	13,900	11,350
Grand Teton	1,010	--	--	--	1,010	--
Rocky Mountain	12,650	--	--	--	12,650	--
Yellowstone	115,470	--	--	--	115,470	--
Total	135,140	3,580	7,890	7,770	143,030	11,350

1/ The acres reported as treated through December 31, 1966, include some that have been retreated.

2/ At present time, only Glacier National Park has an antibiotic treatment program. Control in other Parks is based on ribes eradication only.